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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/661,728

09/12/2003

Wu Li

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12/23/2009

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EXAMINER

THOMPSON, CAMIE S

ART UNIT

PAPER NUMBER

1794

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/661,728	<b>Applicant(s)</b> LI ET AL.	
	<b>Examiner</b> Camie S. Thompson	<b>Art Unit</b> 1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on RCE filed 9/30/09.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,3-6,8-28 and 46-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3-6, 8-28 and 46-48 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 9, 2009 has been entered.
2. Applicant's amendment and accompanying remarks filed September 9, 2009 are acknowledged.
3. Examiner acknowledges amended claim 1.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 3-6, 8-28 and 46-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al., U.S. Patent Number 5,142,192 in view of Yano et al., U.S. Patent Number 6,699,596.

Takahashi discloses an electroluminescent element that includes insulating layers on both sides of a luminous layer wherein the luminous layer comprises ZnS:Mn (see column 3, lines 62-63) and the insulating layer comprises a fluoride-containing material such as MgF<sub>2</sub> (see column

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3, lines 51-68). Additionally, embodiment 4 of the Takahashi reference discloses that the luminous layer can comprise SrS:Ce. Takahashi does not disclose that the phosphor layer is a rare earth metal activated barium thioaluminate or rare earth activated magnesium barium thioaluminate. Yano discloses a blue full color EL display comprising a phosphor thin film wherein the phosphor is a barium thioaluminate or magnesium barium thioaluminate with europium added as the activator (see column 2, lines 46-68). Column 3, lines 1-16 discloses that the atomic ratio of Mg to Ba may fall in the range between 0.05 and 0.8,  $x = 1-5$ ,  $y = 1$  to  $15$ ,  $z = 3-30$  and  $w = 3-30$ . Also, the reference discloses that the phosphor thin layer is sandwiched between first and second insulating layers (see Figure 2 and column 6, lines 42-53). Column 2, lines 64-68 of the Yano reference discloses that oxygen may substitute for sulfur in barium thioaluminate to yield an oxysulfide. Also, example 1 of the Yano reference discloses that the magnesium barium thioaluminate film contains a substantial amount of oxygen. It is disclosed in column 6, lines 53-68 of the Yano reference that the substrate can be a glass or glass ceramic substrate. Yano also discloses that the phosphor thin film is annealed at 400 to 800 °C. Additionally, Yano discloses that the light emitting layer comprising the phosphor thin film of magnesium barium thioaluminate is preferably about 100 to 2,000 nm thick (see column 4, lines 58-64). Column 7, lines 11-43 of the Yano reference discloses that the first thick film insulating layer has a thickness of 5-50  $\mu\text{m}$  and the second insulating layer has a thickness of 100 to 500 nm. Yano also discloses that the first insulating layer can be barium titanate as per instant claim 47. Figure 2 of the Yano reference discloses a dielectric layer. Yano discloses in column 1 that blue luminescence can be achieved by SrS:Ce (same phosphor used in Takehashi reference). Yano also discloses that the layers are annealed. However, Yano does disclose that the

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luminescence of SrS:Ce is short and that blue luminescence can be improved using thioaluminate phosphors such as BaAl<sub>2</sub>S<sub>4</sub>:Eu (see column 1, lines 40-60). Therefore, it would have been obvious to one of ordinary skill in the art to use a thioaluminate phosphor such as BaAl<sub>2</sub>S<sub>4</sub>:Eu in an electroluminescent element in order to have blue light with higher purity and a display of better quality. Neither reference discloses that the fluoride from the fluoride containing layer is partially infused into the phosphor layer. However, Yano does disclose that the layers are annealed as required by the present claims. Therefore, it would have been obvious to one of ordinary skill in the art to recognize that the fluoride from the insulating layer would be partially infused into the phosphor layer since the layer are annealed.

### ***Response to Arguments***

6. Applicant's arguments filed September 9, 2009 have been fully considered but they are not persuasive. Applicant has amended independent claim 1 to recite that the fluorine from the fluoride containing layer is partially infused into said phosphor thin film layer, without adverse effects on luminosity of the phosphor. Applicant argues that the Takahashi reference fails to teach a blue light emitting phosphor layer. Takahashi discloses a luminous layer wherein the phosphor material can comprise SrS:Ce, which is a blue light emitting phosphor. Although Takahashi does not disclose that the phosphor layer is a rare earth metal activated barium thioaluminate, Takahashi discloses the same multilayered structure as the present claims with a fluoride containing layer and a blue phosphor layer. Yano discloses that thioaluminate blue base phosphors solve the problem of short luminance from blue phosphors such as SrS:Ce. Yano was brought in to show that barium thioaluminate phosphors are used in the light emitting layer with

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insulating layers on both sides of the light emitting layer wherein the thioaluminate phosphors provide higher purity of blue light emission. Applicant argues that Takahashi discloses ZnSiMn phosphor. Embodiment 1 of the Takahashi reference discloses a blue light emitting phosphor, SrS:Ce. Applicant argues that Takahashi includes an extensive laundry list of insulating layer materials. Takahashi provides for nitrides, oxides and fluorides, with calcium fluoride and magnesium fluoride specifically listed. Applicant argues that Takahashi does not teach annealing or the use of annealing temperatures to control the effect of the insulating layer on luminosity. Yano was brought in to show that barium thioaluminate phosphors can be used in place of SrS:Ce to provide for higher blue light emission for the light emitting layer. Takahashi and Yano both disclose the same multilayered structure with insulating layers on both sides of a blue phosphor light emitting layer. Yano discloses that annealing the multilayered structure promotes a blue shift of higher light emission. It is disclosed in Yano that the thioaluminate is diffused into the multilayer, which would have the insulating materials infused into the phosphor layers. Yano discloses that the annealing treatment is effective for an outstandingly increase in the blue light emission (see column 4 of the Yano reference). The combination of the Takahashi and the Yano references provides for increased blue light emission using thioaluminate phosphors that are annealed and infused with the insulating layers. Applicant's argument is not persuasive. Yano discloses that better blue light emission is achieved when using thioaluminate phosphors in place of SrS:Ce in the same layered structure in the Takahashi reference and the present claims. The references provide the motivation for the combination. The rejection is maintained.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Camie S. Thompson whose telephone number is 571-272-1530. The examiner can normally be reached on Monday-Friday 8:00 am - 6:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on 571-272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Camie S Thompson/

Examiner, Art Unit 1794

/D. Lawrence Tarazano/

Supervisory Patent Examiner, Art Unit 1794